



The effect of interpersonal communication competence on online game addiction among university students

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ABSTRACT

Online game addiction (OGA) has emerged as a significant psychological issue among university students, although the influence of interpersonal communication competency on this phenomenon is inadequately elucidated. This research investigated the correlations between interpersonal communication competence (ICC) and OGA among university students in Russia. The study involved 384 students from a state university and employed a convenience sample method predicated on voluntary participation. Data were gathered using an online questionnaire and examined utilizing partial least squares structural equation modeling (PLS-SEM). The results revealed that the environmental control dimension had significant negative effects on tolerance and withdrawal, while the interaction management dimension showed significant positive effects on significance and problems. Additional group analyses revealed that various relationships varied according to gender and daily Internet usage duration. Overall, ICC failed to successfully explain why people became addicted to online games. The study contributed to the research literature by demonstrating that ICC is not a consistent protective factor against OGA and that its effects are specific to certain dimensions and contexts. These findings suggest that communication-related issues should be examined alongside broader

psychosocial variables in research and intervention efforts addressing problematic gaming among university students.

Keywords: interpersonal communication competence, online game addiction, university students, structural equation modeling, PLS-SEM

INTRODUCTION

Playing online games has become a common part of young adults' daily lives. This is particularly true for college students who use digital media for entertainment, social interaction, and stress relief. However, excessive gaming can develop into online game addiction (OGA). This problem has been linked to poor academic performance, social isolation, and mental health problems (Anjum et al., 2024; King et al., 2020; Lee et al., 2019; Rosendo-Rios et al., 2022). Although gaming can provide enjoyment and social connections, its problematic form has become a significant psychosocial problem for college students (Bhagat et al., 2020; Sun et al., 2023).

Interpersonal communication competence (ICC) refers to the ability to communicate effectively and appropriately with others. This is an important resource for building relationships, maintaining social cohesion, and managing daily interactions (Çikrikçi, 2024; Giri, 2023; Sharpe et al., 2019; van Tonder et al., 2023). ICC is not a single skill. It consists of many different components, such as controlling the environment, self-disclosure, being assertive, managing interactions, and reacting immediately. These factors increase relationship quality and emotional well-being (Atta et al., 2024; Kämäräinen et al., 2024). Communication competence is crucial for university students' academic performance and social integration (Abid et al., 2022; Martin, 2014).

ICC may be associated with OGA for several reasons. Students with low communication competence may have more difficulty forming satisfying offline relationships. They may also experience loneliness, social frustration, or a weaker sense of belonging. In such cases, online games may become an alternative space for interaction, recognition, and emotion regulation (Bhagat et al., 2020; Chen et al., 2023; Lee et al., 2019). Previous research suggests that interpersonal difficulties and poor social skills are associated with the likelihood of problematic gaming (Bhagat et al., 2020; Erdogan, 2023). In contrast, improved communication skills can facilitate the establishment of supportive relationships and reduce addiction to gaming as an escape from real-life problems (Lee et al., 2019; Škařupová & Blinka, 2016). This does not mean that communication skill is the only cause of gaming addiction. There are many psychological and social factors that can lead to OGA, such as personality, social anxiety, family ties, and peer environment (Chang et al., 2023; Kang et al., 2012; Liu & Kuo, 2007).

Against this background, the specific role of ICC dimensions in OGA has not been adequately elucidated. Previous studies have shown general links between interpersonal problems and problematic gaming; however, fewer studies have examined how different dimensions of the ICC relate to different dimensions of OGA, particularly among college students. This limitation is important as both ICC and OGA are multidimensional concepts. Hence, a more detailed analysis could clearly explain the relationship between them. In this context, this study examines whether the dimensions of environmental control, self-disclosure, assertiveness, interaction management, and immediacy are related to dimensions of OGA among college students. The study also examines whether these relationships differ according to gender and duration of daily Internet use. By focusing on the multidimensional nature of both concepts, the study aims to provide a more precise understanding of how communication competence relates to problematic gaming patterns in college students.

LITERATURE REVIEW

Interpersonal Communication Competence

ICC is the ability to talk to people clearly and politely. This means not only expressing clearly what you mean but also responding to others in a way that is appropriate to the situation at the time. In the context of higher education, this ability is crucial as students depend on interpersonal communication for academic

collaboration, friendship building and daily social adjustment (Abid et al., 2022; Martin, 2014; Sharpe et al., 2019).

ICC should be treated as a multidimensional construct rather than a single general skill. Rubin and Martin (1994) conceptualized ICC as a set of related but distinct abilities. This perspective is important for the present study because different dimensions of communication may have different psychological and behavioral consequences. In other words, students may be competent in one aspect of communication but weaker in another. This makes a dimension-based approach more useful than a general competence score when examining its possible relationship with OGA (Merlin et al., 2024; Yakushina, 2023).

The current study focuses on five dimensions of ICC: environmental control, self-disclosure, assertiveness, interaction management, and immediacy. Environmental control refers to the ability to adapt communication to the demands of the context and to influence interaction in an effective way. Self-disclosure refers to sharing personal thoughts and feelings in a way that supports relationship development. Assertiveness involves expressing one's needs and opinions clearly and appropriately. Interaction management refers to maintaining the flow and organization of communication. Immediacy reflects warmth, closeness, and communicative availability in interpersonal contact. Together, these dimensions capture both the strategic and relational aspects of communication competence. These factors are particularly important in the context of academic life. Students with strong communication skills are more likely to make friends, resolve conflicts, and succeed in both school and social settings. Previous research indicates that interpersonal competence is associated with students' social and academic performance; however, the extent of this association may vary depending on educational and cultural contexts (Kämäräinen et al., 2024; Santos et al., 2019; Sarwari et al., 2018). For this reason, ICC should be examined not only as a desirable social skill but also as a factor that may shape how students cope with loneliness, belongingness, and everyday stress.

This point is important for the present study. If ICC helps students build satisfying offline relationships, some of its dimensions may also be related to lower problematic involvement in online gaming. The next section, therefore reviews OGA and the psychosocial factors associated with it.

Core dimensions of ICC

In the present study, ICC is examined through five dimensions: environmental control, self-disclosure, assertiveness, interaction management, and immediacy. These dimensions were selected because they reflect different but related aspects of interpersonal communication. Examining them separately is important because communication competence does not operate as a single and uniform skill. Instead, some dimensions may be more strongly related than others to students' coping styles, relationship patterns, and behavioral tendencies.

Environmental control refers to the ability to adapt your communication style to the situation and exert a significant influence on the context of an interaction. This dimension indicates how well people can manage social situations and control their responses to them. This skill can help students better cope with the pressures of college life and manage stress in more constructive ways (Huang & Lin, 2018; Rubin & Martin, 1994).

Self-disclosure is the act of expressing your thoughts, feelings, and experiences to others in an appropriate manner. This trait is crucial for building trust, closeness, and the development of relationships. Among university students, self-disclosure can facilitate the development of meaningful face-to-face relationships and increase perceived social support (Buhrmester et al., 1988; Huang & Lin, 2018).

Assertiveness means clearly stating your desires, boundaries, and ideas while also respecting those of others. This skill enables people to communicate directly with one another without being overly withdrawn or hostile. In student life, assertiveness may contribute to healthier peer relationships and better interpersonal adjustment (Buhrmester et al., 1988; Xu et al., 2019).

Interaction management refers to the ability to maintain the flow, timing, and organization of communication. It includes managing turn-taking, sustaining attention, and guiding interpersonal exchange in an effective way. This dimension is especially relevant in social contexts where students need to participate actively and maintain reciprocal communication (Rubin & Martin, 1994; Lijie et al., 2023; Xu et al., 2019).

Immediacy reflects warmth, closeness, openness, and communicative availability in interpersonal contact. It helps create a sense of connection and relational presence. In university settings, immediacy may support belongingness and strengthen the quality of everyday social interaction (Bochner & Kelly, 1974; Xu et al., 2019).

Taken together, these five dimensions represent both the strategic and relational components of interpersonal communication. They are also relevant to university students' everyday functioning because they shape how students form relationships, manage social demands, and experience connection with others. For this reason, examining these dimensions separately may provide a more precise basis for understanding whether communication competence is related to OGA.

Online Game Addiction

OGA is a habit of excessive and uncontrolled gaming that makes it difficult to carry out daily tasks, maintain social relationships, and fulfill personal responsibilities. Digital games are a popular way to have fun and spend time with others, but excessive use of these games can lead to problems at school, in emotional life, and in relationships (Anjum et al., 2024; Kaya et al., 2024; Kim et al., 2022). Consequently, OGA has emerged as a significant psychosocial issue, particularly among adolescents and college students.

OGA is frequently examined alongside Internet gaming disorder in the academic literature. Research in this field has shifted from general concerns about video game use to a greater focus on specific risks associated with online gaming environments (Hu et al., 2022; Kuss & Griffiths, 2012). This shift is particularly important because online games differ from face-to-face games in various ways. Online games typically feature constant access, social interaction, competition, and reward systems that can encourage people to keep playing.

A useful framework for understanding this problem is Griffiths' (2005) components model of addiction. According to this model, addictive behavior includes salience, mood modification, tolerance, withdrawal, conflict, and relapse (Griffiths & Pontes, 2020). Salience refers to the dominance of gaming in everyday life. Mood modification refers to using gaming to change emotional states. Tolerance reflects the need to spend increasing amounts of time gaming. Withdrawal refers to discomfort when gaming is reduced or stopped. Conflict involves problems between gaming and other obligations. Relapse refers to repeated failure to control or reduce gaming behavior. This multidimensional perspective is important for the present study because it allows problematic gaming to be examined in a more detailed way rather than as a single undifferentiated behavior.

OGA has been reported in many countries; however, prevalence rates vary significantly across studies (Bekir & Çelik, 2019; Burén et al., 2021; Ding & Li, 2023). This variation is influenced by factors such as sampling methods, age distribution, language, and assessment tools (Kim et al., 2022). Nevertheless, recent research indicated that excessive gaming is a major problem for students. Because online games integrate seamlessly into university students' daily activities, social networks, and coping strategies, students may be particularly vulnerable in this regard (Sun et al., 2023; Wan Yaacob et al., 2021). This issue is particularly relevant in the Russian context, where recent studies have identified gaming disorder as a major cause for concern among university students (Konstantinov et al., 2024; Tereshchenko et al., 2021).

Contribution of Psychological and Social Factors

OGA is shaped by multiple psychological and social factors. It cannot be explained by a single personal characteristic or behavior. Previous studies show that problematic gaming is associated with emotional, cognitive, interpersonal, and environmental influences. Therefore, OGA should be addressed within a broader psychosocial framework and not as a behavioral problem in isolation (Chang et al., 2023; Kim et al., 2022).

Among psychological factors, loneliness, poor emotion regulation, low self-esteem, and weak self-regulation are frequently associated with problematic gaming. Students who experience loneliness or emotional distress may use online games to reduce negative feelings, escape daily stress, or compensate for unmet social needs (Ekinci et al., 2021; Kochetkov, 2016; Lee et al., 2019). Similarly, depression, anxiety, and maladaptive gaming-related beliefs may increase the risk of excessive gaming by making online environments more attractive as a coping strategy (Phetphum et al., 2023). Certain personality traits, such as narcissistic

tendencies and an external locus of control, have been linked to an increased risk of addiction in numerous studies (Yılmaz et al., 2023).

Social and interpersonal factors are also important. Support from family and friends, along with a sense of belonging, can either reduce or increase the risk of OGA (Cemiloglu et al., 2022; Ding & Li, 2023). While strong family bonds and supportive peer networks can function as protective factors, harmful relationships, insufficient social support, and a tendency to seek validation in online communities can intensify destructive gaming behaviors (Ar Rosyid et al., 2019; C. Choi et al., 2018; Li et al., 2024). In the same way, limited parental supervision and disrupted family communication may create conditions that make excessive gaming more likely (C. Choi et al., 2018; Fahrizal & Aprilia, 2021).

Contextual factors also deserve attention. School environment, social participation, screen exposure, and broader social conditions may shape gaming behavior. Supportive school settings and participation in non-gaming social activities may reduce the risk of addiction by strengthening offline engagement and social connectedness (Andreetta et al., 2020; Chang et al., 2023). By contrast, increased isolation and screen time, especially during periods such as the COVID-19 pandemic, may intensify problematic gaming patterns (Ekinci et al., 2021; Gómez-Galán et al., 2020; Saritepeci et al., 2023).

Taken together, these findings show that OGA has a multidetermined structure. Psychological vulnerability, social relationships, and environmental conditions all contribute to its development. This point is important for the present study because ICC should not be viewed as the only determinant of gaming addiction. Rather, it should be examined as one interpersonal factor within a broader psychosocial context.

The Effect of ICC on OGA

ICC may be related to OGA because communication skills shape how individuals build relationships, cope with stress, and respond to unmet social needs. Students with limited interpersonal competence may have more difficulty establishing satisfying offline relationships (Merlin & Soubramanian, 2024; Yakushina, 2023). As a result, they may turn to online games not only for entertainment, but also for belonging, recognition, and emotional relief. Previous studies suggest that interpersonal difficulties and weak social competence are associated with a higher risk of problematic gaming (Bhagat et al., 2020; Erdogan, 2023; Kanat, 2019; Lee et al., 2019).

This possible relationship should not be understood in a uniform way. Different dimensions of ICC may be linked to problematic gaming through different mechanisms. Environmental control may reduce problematic gaming because students who manage social situations effectively may also regulate their time and interaction environments more successfully. Self-disclosure may support trust and closeness in offline relationships, which can reduce the need to seek emotional compensation in online spaces. Assertiveness may also function as a protective factor because students who can express their needs and boundaries clearly may show better interpersonal adjustment and less withdrawal from offline social life.

At the same time, not all dimensions of ICC are expected to operate in the same direction or with the same strength. Interaction management, which involves the ability to control and organize communication, can help build healthy relationships. This skill might also lead to more involvement in social gaming. Similarly, immediacy, which helps create warmth and connection in face-to-face interactions, could reduce problematic gaming.

However, the strength and direction of these associations may vary depending on how students use digital environments and how they meet their social needs. For this reason, the relationship between ICC and OGA should be examined at the level of specific dimensions rather than through a single overall score.

Although previous studies indicate that interpersonal problems are linked to problematic gaming, evidence on the role of specific ICC dimensions remains limited, especially among university students. This gap is important because both ICC and OGA are multidimensional constructs. Examining their dimensions together may provide a more detailed explanation of which communication skills are more closely associated with specific addiction symptoms. Based on this framework, the present study tests the effects of environmental control, self-disclosure, assertiveness, interaction management, and immediacy on the dimensions of OGA.

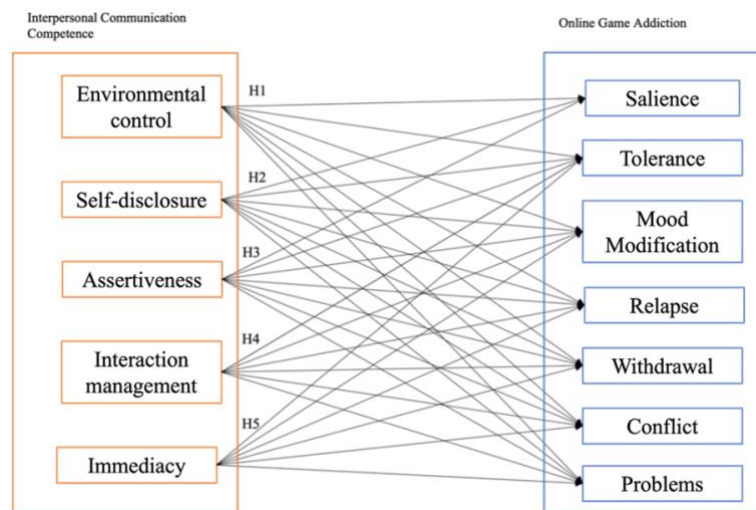


Figure 1. Hypothetical model (Source: Created by the authors)

Although previous studies suggest that interpersonal difficulties are associated with problematic gaming, the role of specific dimensions of ICC remains unclear. This limitation is important because both ICC and OGA are multidimensional constructs. Existing research has more often focused on general interpersonal problems, loneliness, or broad social competence, while fewer studies have examined how specific communication dimensions relate to specific addiction symptoms among university students. In addition, evidence on whether these relationships differ by gender and daily Internet use duration is still limited. For this reason, the present study examines the effects of environmental control, self-disclosure, assertiveness, interaction management, and immediacy on the dimensions of OGA. It also investigates whether these relationships vary according to gender and daily Internet use duration.

Based on the literature, ICC is expected to be associated with OGA. However, this relationship may vary across specific communication dimensions (Figure 1). In this context, the following hypotheses have been proposed.

1. **H1.** Environmental control is negatively associated with the dimensions of OGA.
2. **H2.** Self-disclosure is negatively associated with the dimensions of OGA.
3. **H3.** Assertiveness is negatively associated with the dimensions of OGA.
4. **H4.** Interaction management is associated with the dimensions of OGA.
5. **H5.** Immediacy is negatively associated with the dimensions of OGA.
6. **H6.** The relationships between ICC dimensions and OGA dimensions differ according to gender.
7. **H7.** The relationships between ICC dimensions and OGA dimensions differ according to daily Internet use duration.

METHODOLOGY

Research Design

This study employed a cross-sectional quantitative design to examine the relationships between university students' ICC and OGA. The study was conducted at Almet'yevsk State Technological University and Peoples' Friendship University of Russia. Data were collected between September and October 2024. The study focused on the effects of the dimensions of ICC on the dimensions of OGA. The proposed relationships were tested by using partial least squares structural equation modeling (PLS-SEM).

Participants and Sampling

The study sample consisted of university students enrolled at Almet'yevsk State Technological University and Peoples' Friendship University of Russia. No department- or faculty-based restriction was applied during recruitment. Participants were recruited through announcements shared on the university platform and in

course groups, and the online survey link was distributed through these channels. The study used convenience sampling and was based on voluntary participation.

A power analysis indicated that a minimum sample size of 364 participants was required for the analysis. Data collection was terminated when the required number of participants was reached. A total of 400 students were reached during the data collection process. Of these, 391 responses were received. During data screening, seven questionnaires were excluded because they were carelessly completed. As a result, 384 observations were included in the final analysis. Participants were 61% female and 39% male. When the age groups are analyzed, 18-19 is 53%, 20-21 is 23%, 22-23 is 13% and 24 and over is 11%. When the daily Internet usage is analyzed, the rate of those who use the Internet for 7 hours or more is 40%.

Data Collection Measures

The data collection form consisted of three parts. The first part included questions on the demographic characteristics of the participants. The second part included the ICC Scale. The third part included the OGA Scale.

ICC scale

The ICC scale is a self-report scale that assesses 10 dimensions of ICC, namely self-disclosure, empathy, social relaxation, assertiveness, alter centrism, interaction management, expressiveness, supportiveness, immediacy, and environmental control. A sample of 177 undergraduate nursing students was used in the validity and reliability studies conducted during the adaptation of the scale into Brazilian Portuguese. As a result of confirmatory factor analysis and principal component analysis, the scale was reduced to 17 items and 5 sub-dimensions. The sub-dimensions were determined as environmental control, self-disclosure, assertiveness, interaction management, and immediacy. As a result of the validity and reliability analyses of the scale, the Cronbach's alpha coefficient of the 17-item final version was found to be .82, and the Cronbach's alpha coefficient among the five sub-dimensions was found to be .71. The Cronbach's alpha values within the sub-dimensions varied between .53 and .71. We used this scale in our study. The scale items are evaluated on a 5-point Likert-type scale (1 = almost never, 5 = almost always). The total score that can be obtained from the scale ranges from 17 to 85, and higher scores indicate higher ICC.

OGA scale

The OGA Scale used in the study was developed by Lemmens et al. (2009) and is based on the DSM criteria for pathological gambling. The scale aims to measure seven main criteria of gaming addiction: salience, tolerance, mood modification, relapse, withdrawal, conflict, and problems. The scale has both a 21-item long version and a 7-item short version. Both versions showed satisfactory psychometric properties in terms of reliability and validity. Cronbach's alpha of the 21-item version was .94 in the first sample and .92 in the second sample. We used the 21-item long version in our study. The scale items are answered on a 5-point Likert-type scale (1 = never, 5 = very often). High scores on the scale indicate a high level of gaming addiction. Although the scale was developed and tested on adolescents, it is stated that the items can be adapted to different age groups.

Translation and language validation procedure

The same procedure was used to establish the language validity of both scales. First, the scales were translated from English into Russian. Then, another person translated the Russian version back into English. In the third stage, the original and translated versions were compared. Since no semantic difference was identified, it was decided to use the Russian version. To test the comprehensibility of the scales for the target group, they were administered to a group of 20 students who were not included in the main sample. The students were asked whether they understood each item. The students stated that all items were understandable. After this process, the scales were administered to the main study group.

Data Collection Procedure

Data were collected through an online questionnaire. At the beginning of the survey, students were asked whether they agreed to participate voluntarily in the study. Students who did not provide consent were not

shown the survey items and were only presented with a thank-you message. Only students who agreed to participate voluntarily were allowed to continue to the questionnaire. Participants were informed that their participation was voluntary and that they could withdraw from the study at any time. The contact e-mail address of the researcher was also provided in the survey form. In addition, participants were informed that the data would be used only for academic purposes. The questionnaire did not include any item that could directly reveal the individual identity of the participants. Necessary permissions to conduct the study were obtained from the university administration before the data collection process began.

Data Analysis

The study examined the correlations between OGA and ICC via PLS-SEM. Since the sample size is less than 10 times the number of items, PLS-SEM was mostly employed for the complex effect connections between the sub-dimensions of the scales (Hair et al., 2017; Sarstedt et al., 2014). RStudio's "semnr" tool helped the data to be examined. Reliability of Cronbach's alpha, rho_A, and composite reliability (CR) coefficients were investigated in the assessment of the measuring model. Using factor loadings, average variance explained (AVE), Fornell-Larcker criterion and heterotrait-monotrait (HTMT) ratio values, one obtained validity. Factor loadings above 0.70, CR values above 0.70 and AVE values above 0.50 indicate that convergent validity is achieved (Hair et al., 2017; Sarstedt et al., 2014). In the Fornell-Larcker criterion, the AVE square root of each construct being greater than its correlations with other constructs and HTMT values being below 0.90 are considered as evidence of discriminant validity (Henseler et al., 2015).

In the second stage, the structural model was assessed. Path coefficients, R^2 values and effect sizes (f^2) were examined in the evaluation of the structural model. While R^2 values show the explanatory power of the model, f^2 values show the effect size of independent variables (Hair et al., 2019). The significance of the path coefficients was evaluated by bootstrap test with 5000 samples. The significance of the path coefficients was tested by bootstrapping with 5,000 resamples. Based on Cohen's (2013) guidelines, f^2 values of .02, .15, and .35 were interpreted as small, medium, and large effects, respectively. In addition, multiple group analysis (MGA) was conducted according to gender and daily Internet usage time variables. MGA results reveal the differences in path coefficients between groups and the statistical significance of these differences (Sarstedt et al., 2011).

RESULTS

As shown in **Table 1**, all retained item loadings ranged from .72 to .92, indicating that the items adequately represented their intended constructs. Cronbach's alpha values ranged from .62 to .89, and CR values ranged from .83 to .93. In addition, all AVE values were above .50. Taken together, these findings indicate that the measurement model met the required criteria for internal consistency reliability and convergent validity.

Table 1. Factor loading and reliability coefficients

Factors	Items	Loading	alpha	rhoA	rhoC	AVE
Environmental control	CCS2	0.892	0.835	0.860	0.899	0.749
	CCS3	0.825				
	CCS4	0.878				
Self-disclosure	CCS7	0.757	0.621	0.742	0.832	0.714
	CCS8	0.924				
Assertiveness	CCS10	0.865	0.707	0.713	0.872	0.773
	CCS12	0.893				
Interaction management	CCS13	0.923	0.667	0.761	0.851	0.742
	CCS14	0.795				
Immediacy	CCS15	0.728	0.758	0.815	0.855	0.663
	CCS16	0.844				
	CCS17	0.865				
Salience	GA1	0.793	0.776	0.821	0.864	0.68
	GA2	0.833				
	GA3	0.847				
Tolerance	GA4	0.764	0.726	0.756	0.842	0.639
	GA5	0.794				

Table 1 (Continued).

Factors	Items	Loading	alpha	rhoA	rhoC	AVE
	GA6	0.839				
Mood modification	GA7	0.863				
	GA8	0.863	0.843	0.904	0.900	0.750
	GA9	0.873				
Relapse	GA10	0.728				
	GA11	0.747	0.652	0.653	0.812	0.591
	GA12	0.827				
Withdrawal	GA13	0.910				
	GA14	0.908	0.893	0.915	0.933	0.822
	GA15	0.901				
Conflict	GA16	0.865				
	GA17	0.853	0.830	0.834	0.898	0.745
	GA18	0.872				
Problems	GA19	0.817				
	GA20	0.897	0.755	0.832	0.856	0.666
	GA21	0.724				

Table 2. HTMT ratio

Factors	1	2	3	4	5	6	7	8	9	10	11
Environmental control -1	-	-	-	-	-	-	-	-	-	-	-
Self-disclosure -2	0.629	-	-	-	-	-	-	-	-	-	-
Assertiveness -3	0.888	0.656	-	-	-	-	-	-	-	-	-
Interaction management -4	0.773	0.777	0.941	-	-	-	-	-	-	-	-
Immediacy-5	0.741	0.845	0.844	0.834	-	-	-	-	-	-	-
Saliency-6	0.134	0.099	0.143	0.050	0.085	-	-	-	-	-	-
Tolerance-7	0.188	0.096	0.175	0.059	0.110	0.867	-	-	-	-	-
Mood modification-8	0.078	0.083	0.115	0.105	0.117	0.754	0.714	-	-	-	-
Relapse-9	0.222	0.187	0.192	0.070	0.155	0.833	0.906	0.607	-	-	-
Withdrawal-10	0.277	0.193	0.229	0.178	0.240	0.660	0.677	0.506	0.815	-	-
Conflict-11	0.171	0.180	0.183	0.096	0.201	0.683	0.754	0.510	0.949	0.811	-
Problems-12	0.107	0.131	0.078	0.086	0.133	0.782	0.917	0.682	0.931	0.699	0.893

Table 3. Fornell-Larcker criterion

Factors	1	2	3	4	5	6	7	8	9	10	11	12
Environmental control -1	0.866	-	-	-	-	-	-	-	-	-	-	-
Self-disclosure -2	0.491	0.845	-	-	-	-	-	-	-	-	-	-
Assertiveness -3	0.683	0.459	0.879	-	-	-	-	-	-	-	-	-
Interaction management -4	0.578	0.521	0.656	0.861	-	-	-	-	-	-	-	-
Immediacy-5	0.611	0.582	0.628	0.594	0.814	-	-	-	-	-	-	-
Saliency-6	-0.12	-0.08	-0.12	0.015	-0.08	0.825	-	-	-	-	-	-
Tolerance-7	-0.16	-0.07	-0.13	-0.02	-0.07	0.654	0.800	-	-	-	-	-
Mood modification-8	-0.07	-0.07	-0.07	0.016	-0.08	0.595	0.547	0.866	-	-	-	-
Relapse-9	-0.17	-0.12	-0.13	-0.05	-0.11	0.61	0.634	0.453	0.769	-	-	-
Withdrawal-10	-0.25	-0.16	-0.19	-0.15	-0.21	0.561	0.559	0.445	0.619	0.906	-	-
Conflict-11	-0.15	-0.14	-0.14	-0.07	-0.17	0.57	0.589	0.436	0.694	0.698	0.863	-
Problems-12	-0.09	-0.09	-0.04	0.047	-0.07	0.618	0.668	0.556	0.652	0.569	0.702	0.816

The HTMT results were used to assess discriminant validity between the constructs (Table 2). Among the ICC dimensions, the highest HTMT value was observed between assertiveness and interaction management (.941). Among the OGA dimensions, relatively high HTMT values were observed for relapse and conflict (.949), tolerance and problems (.917), and relapse and problems (.931). These values may be considered acceptable because the compared constructs are conceptually close (Sarstedt et al., 2023). In contrast, HTMT values between the ICC dimensions and the OGA dimensions were low and ranged from .050 to .277. The highest of these values was observed between environmental control and withdrawal (.277). Overall, these findings provide acceptable evidence of discriminant validity.

The Fornell-Larcker criterion also supported discriminant validity (Table 3). For each construct, the square root of the AVE was greater than the correlations with the other constructs. Therefore, the constructs were considered empirically distinct.

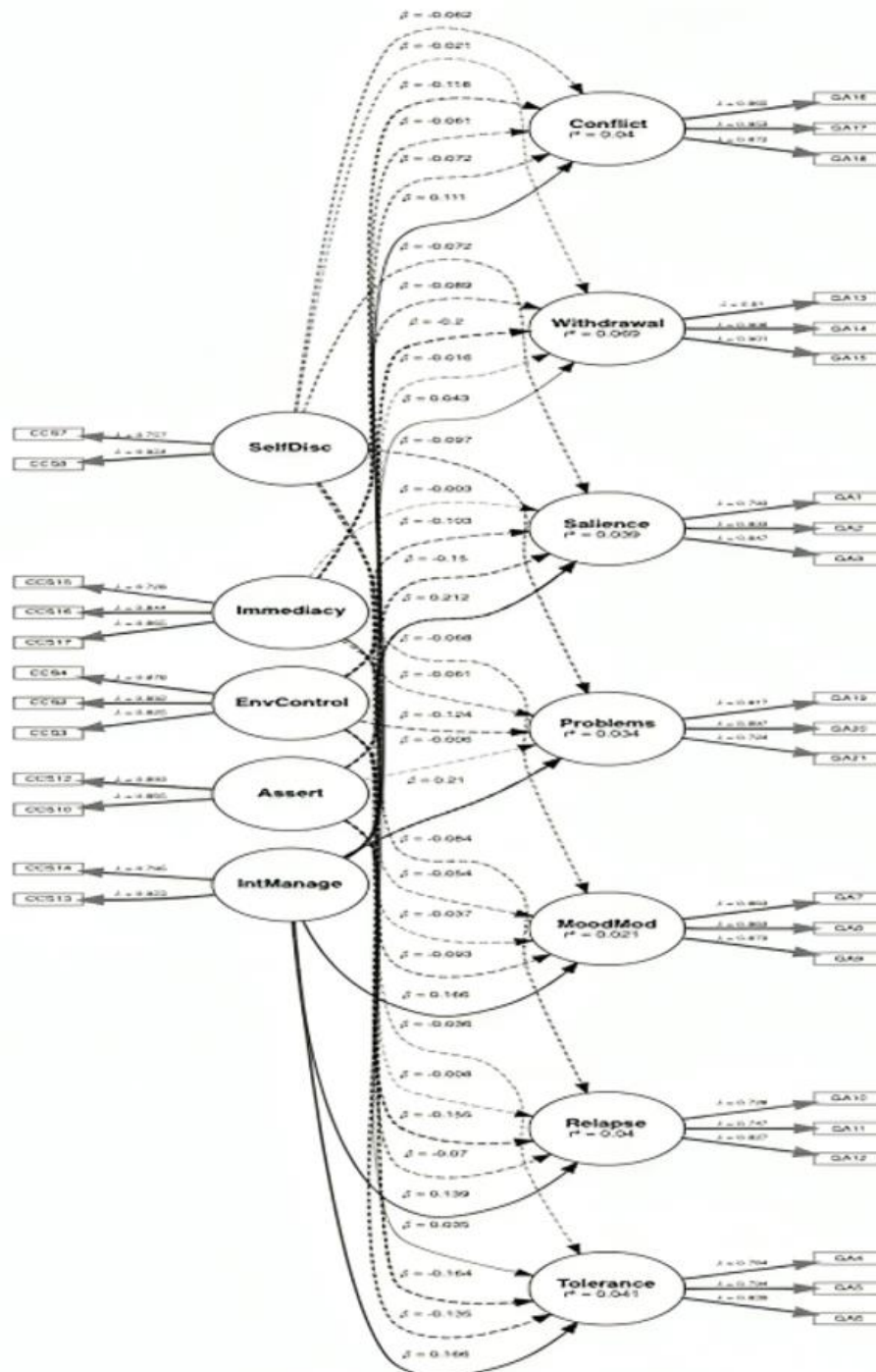


Figure 2. Structural equation model (Source: Created by the authors)

Figure 2 presents the significant and non-significant structural paths in the model. The structural model results showed that only a limited number of paths were statistically significant (**Table 4**). Environmental control had a significant negative effect on tolerance ($\beta = -.164, p < .05$) and withdrawal ($\beta = -.200, p < .05$), indicating that higher environmental control was associated with lower levels of these addiction dimensions. In contrast, interaction management had a significant positive effect on salience ($\beta = .212, p < .05$) and problems ($\beta = .210, p < .05$). This unexpected finding suggests that higher interaction management was associated with higher levels of salience and problems. The effects of self-disclosure, assertiveness, and immediacy on the OGA dimensions were not statistically significant ($p > .05$). Overall, the findings indicate that the relationships between ICC and OGA were selective rather than widespread across dimensions.

Table 4. Path coefficient for model

Paths	Original estimate	Bootstrap mean	Bootstrap SD	2.5% CI	97.5% CI
EnvControl -> Salienc	-0.103	-0.104	0.083	-0.264	0.063
EnvControl -> Tolerance	-0.164	-0.165	0.073	-0.300	-0.013
EnvControl -> MoodMod	-0.037	-0.042	0.091	-0.221	0.134
EnvControl -> Relapse	-0.155	-0.153	0.082	-0.297	0.023
EnvControl -> Withdrawal	-0.200	-0.199	0.068	-0.332	-0.061
EnvControl -> Conflict	-0.061	-0.059	0.070	-0.193	0.080
EnvControl -> Problems	-0.124	-0.121	0.090	-0.281	0.072
SelfDisc -> Salienc	-0.072	-0.076	0.072	-0.211	0.068
SelfDisc -> Tolerance	-0.036	-0.036	0.076	-0.184	0.110
SelfDisc -> MoodMod	-0.068	-0.068	0.077	-0.213	0.087
SelfDisc -> Relapse	-0.084	-0.084	0.080	-0.240	0.075
SelfDisc -> Withdrawal	-0.021	-0.022	0.080	-0.180	0.133
SelfDisc -> Conflict	-0.062	-0.061	0.081	-0.218	0.099
SelfDisc -> Problems	-0.097	-0.093	0.081	-0.244	0.071
Assert -> Salienc	-0.150	-0.150	0.087	-0.313	0.024
Assert -> Tolerance	-0.135	-0.137	0.094	-0.310	0.057
Assert -> MoodMod	-0.093	-0.090	0.097	-0.268	0.112
Assert -> Relapse	-0.070	-0.073	0.092	-0.255	0.107
Assert -> Withdrawal	-0.016	-0.021	0.088	-0.211	0.135
Assert -> Conflict	-0.072	-0.074	0.098	-0.259	0.116
Assert -> Problems	-0.006	-0.004	0.095	-0.188	0.180
IntManage -> Salienc	0.212	0.214	0.075	0.064	0.354
IntManage -> Tolerance	0.166	0.168	0.087	-0.006	0.334
IntManage -> MoodMod	0.166	0.174	0.083	-0.002	0.326
IntManage -> Relapse	0.139	0.137	0.088	-0.042	0.302
IntManage -> Withdrawal	0.043	0.045	0.086	-0.118	0.218
IntManage -> Conflict	0.111	0.109	0.092	-0.077	0.285
IntManage -> Problems	0.210	0.203	0.092	0.001	0.360
Immediacy -> Salienc	-0.003	-0.010	0.094	-0.195	0.170
Immediacy -> Tolerance	0.035	0.028	0.090	-0.145	0.208
Immediacy -> MoodMod	-0.054	-0.053	0.105	-0.246	0.158
Immediacy -> Relapse	-0.008	-0.020	0.085	-0.186	0.144
Immediacy -> Withdrawal	-0.089	-0.095	0.090	-0.264	0.089
Immediacy -> Conflict	-0.118	-0.129	0.093	-0.304	0.054
Immediacy -> Problems	-0.061	-0.073	0.119	-0.292	0.163

Note. SD: Standard deviation & CI: Confidence interval

Table 5. R² and adjusted R² values

Factors	R ²	Adjusted R ²
Salienc	0.039	0.026
Tolerance	0.041	0.028
Mood modification	0.021	0.008
Relapse	0.040	0.028
Withdrawal	0.069	0.057
Conflict	0.040	0.027
Problems	0.034	0.022

Table 5 presents the R² and adjusted R² values for the endogenous constructs. The highest explained variance was observed for withdrawal (R² = .069, adjusted R² = .057). For the remaining dimensions, the explained variance ranged from .021 to .041. The lowest explained variance was observed for mood modification (R² = .021, adjusted R² = .008). These results indicate that ICC explained only a small proportion of the variance in the OGA dimensions.

Table 6 presents the f² values for the structural paths. Most effect sizes were below .02 and therefore negligible in practical terms. Only the effect of interaction management on salienc reached the small-effect threshold (f² = .021). Overall, these findings indicate that the practical effects of ICC on OGA were weak.

The gender-based MGA results indicated several significant group differences (**Table 7**). Significant differences were found for the paths from self-disclosure to salienc (p = .018), tolerance (p = .045), and withdrawal (p = .012). In all three cases, the coefficients were positive for male participants (β = .136, β = .132,

Table 6. f^2 coefficient

	Saliency	Tolerance	Mood modification	Relapse	Withdrawal	Conflict	Problems
EnvControl	0.005	0.013	0.000	0.010	0.019	0.001	0.006
SelfDisc	0.003	0.000	0.002	0.004	0.000	0.002	0.006
Assert	0.008	0.007	0.004	0.002	0.000	0.002	0.000
IntManage	0.021	0.011	-0.001	0.010	0.001	0.005	0.016
Immediacy	0.000	0.001	0.002	0.000	0.004	0.007	0.000

Table 7. Path coefficient for model based on gender

Paths	Male	Female	p
EnvControl -> Saliency	-0.012	-0.070	0.349
SelfDisc -> Saliency	0.136	-0.175	0.018
Assert -> Saliency	-0.547	-0.120	0.990
IntManage -> Saliency	0.295	0.164	0.239
Immediacy -> Saliency	0.195	-0.041	0.097
EnvControl -> Tolerance	-0.229	-0.080	0.819
SelfDisc -> Tolerance	0.132	-0.164	0.045
Assert -> Tolerance	-0.313	-0.117	0.822
IntManage -> Tolerance	0.219	0.144	0.342
Immediacy -> Tolerance	0.180	0.006	0.213
EnvControl -> MoodMod	-0.037	-0.004	0.570
SelfDisc -> MoodMod	-0.072	-0.031	0.603
Assert -> MoodMod	-0.175	-0.090	0.666
IntManage -> MoodMod	0.068	0.191	0.729
Immediacy -> MoodMod	0.263	-0.173	0.013
EnvControl -> Relapse	-0.112	-0.158	0.428
SelfDisc -> Relapse	0.049	-0.148	0.162
Assert -> Relapse	-0.364	0.003	0.935
IntManage -> Relapse	0.300	0.039	0.092
Immediacy -> Relapse	0.047	0.013	0.407
EnvControl -> Withdrawal	-0.239	-0.104	0.799
SelfDisc -> Withdrawal	0.226	-0.143	0.012
Assert -> Withdrawal	-0.310	0.079	0.985
IntManage -> Withdrawal	0.020	0.021	0.448
Immediacy -> Withdrawal	-0.015	-0.078	0.369
EnvControl -> Conflict	-0.064	-0.032	0.609
SelfDisc -> Conflict	0.105	-0.136	0.103
Assert -> Conflict	-0.397	0.032	0.985
IntManage -> Conflict	0.152	0.084	0.351
Immediacy -> Conflict	0.029	-0.137	0.192
EnvControl -> Problems	-0.160	-0.117	0.527
SelfDisc -> Problems	-0.029	-0.103	0.348
Assert -> Problems	-0.299	0.080	0.935
IntManage -> Problems	0.330	0.170	0.311
Immediacy -> Problems	0.158	-0.113	0.200

and $\beta = .226$, respectively) but negative for female participants ($\beta = -.175$, $\beta = -.164$, and $\beta = -.143$, respectively). A significant gender difference was also found for the path from Immediacy to mood modification ($p = .013$). This coefficient was positive for male participants ($\beta = .263$) and negative for female participants ($\beta = -.173$). No statistically significant gender differences were observed for the remaining paths.

The MGA results based on daily Internet use duration also revealed significant group differences for selected paths (Table 8). Significant differences were observed for the paths from environmental control to saliency ($p = .018$) and mood modification ($p = .038$). For students who used the Internet for more than 7 hours per day, the coefficients were positive ($\beta = .032$ for saliency; $\beta = .126$ for mood modification), whereas for students who used the Internet for less than 7 hours per day, the coefficients were negative ($\beta = -.307$ for saliency; $\beta = -.217$ for mood modification). No statistically significant differences were found for the remaining paths.

In summary, the results showed that only a limited number of ICC dimensions were significantly associated with OGA dimensions. Environmental control showed negative associations with tolerance and withdrawal,

Table 8. Path coefficient for model based on daily internet usage

Path	Over 7 hours	below 7 hours	p
EnvControl -> Saliency	0.032	-0.307	0.018
SelfDisc -> Saliency	-0.192	0.052	0.946
Assert -> Saliency	-0.182	-0.024	0.829
IntManage -> Saliency	0.347	0.058	0.067
Immediacy -> Saliency	-0.136	0.094	0.882
EnvControl -> Tolerance	-0.075	-0.279	0.098
SelfDisc -> Tolerance	-0.123	0.063	0.863
Assert -> Tolerance	-0.115	-0.087	0.588
IntManage -> Tolerance	0.302	0.034	0.137
Immediacy -> Tolerance	-0.070	0.083	0.754
EnvControl -> MoodMod	0.126	-0.217	0.038
SelfDisc -> MoodMod	-0.091	-0.086	0.534
Assert -> MoodMod	-0.039	-0.037	0.620
IntManage -> MoodMod	0.254	0.124	0.238
Immediacy -> MoodMod	-0.320	0.129	0.978
EnvControl -> Relapse	-0.145	-0.228	0.303
SelfDisc -> Relapse	-0.161	0.021	0.834
Assert -> Relapse	-0.096	0.040	0.803
IntManage -> Relapse	0.245	0.007	0.116
Immediacy -> Relapse	-0.085	-0.008	0.655
EnvControl -> Withdrawal	-0.163	-0.232	0.350
SelfDisc -> Withdrawal	-0.073	0.043	0.735
Assert -> Withdrawal	-0.060	-0.019	0.528
IntManage -> Withdrawal	0.118	0.032	0.404
Immediacy -> Withdrawal	-0.098	-0.145	0.423
EnvControl -> Conflict	-0.064	-0.071	0.475
SelfDisc -> Conflict	-0.116	0.002	0.707
Assert -> Conflict	-0.093	-0.026	0.624
IntManage -> Conflict	0.196	0.036	0.293
Immediacy -> Conflict	-0.150	-0.164	0.474
EnvControl -> Problems	-0.054	-0.151	0.314
SelfDisc -> Problems	-0.132	-0.029	0.726
Assert -> Problems	0.078	0.018	0.423
IntManage -> Problems	0.283	0.048	0.174
Immediacy -> Problems	-0.240	-0.031	0.750

whereas interaction management showed positive associations with salience and problems. Although several group differences emerged across gender and daily Internet use duration, the overall explanatory power and effect sizes of the model were low.

DISCUSSION

The discussion of the findings shows that only two dimensions of ICC, namely environmental control and interaction management, were significantly associated with specific dimensions of OGA. Environmental control showed a negative correlation with tolerance and withdrawal. Environmental control reflects the ability to regulate one's interaction environment and to respond to social demands in a more organized and adaptive way. This finding suggests that students with stronger environmental control may be better able to limit excessive gaming, manage their time more effectively, and maintain stronger offline social engagement (Erdogan, 2023; Lee et al., 2019). In this respect, environmental control may function as a protective interpersonal resource against some symptoms of OGA. Developing these skills may allow individuals to build stronger social connections in real life rather than online (Abid et al., 2022). However, the effect was limited to specific addiction dimensions rather than the full model.

In contrast, interaction management showed positive correlations with salience and problems, which was one of the most notable findings of the study. This result suggests that stronger communication management skills do not necessarily function as a protective factor in all contexts. One possible explanation is that students with stronger interaction management skills may become more socially active within online gaming environments. In such contexts, online games may serve not only as entertainment tools but also as spaces

for interaction, coordination, and social visibility (Bhagat et al., 2020; Škařupová & Blinka, 2016). Accordingly, the social opportunities offered by online games may strengthen engagement for some students and may increase the centrality of gaming in daily life, rather than reducing it (Rosendo-Rios et al., 2022).

By contrast, the effects of the other ICC dimensions, namely self-disclosure, assertiveness, and immediacy, were limited and statistically non-significant across most addiction dimensions. This pattern suggests that communication competence may not influence OGA in a broad and uniform manner. It is possible that these dimensions are more relevant to offline relational functioning than to problematic gaming behavior directly (Sharpe et al., 2019; van Tonder et al., 2023). Nevertheless, these dimensions may still have indirect relevance through related variables such as loneliness, belongingness, and perceived social support (Lee et al., 2019).

The R^2 values obtained in the study also showed that the explanatory power of ICC for OGA was low. The highest explained variance was only 6.9% for withdrawal. This indicates that ICC alone is not sufficient to explain problematic gaming among university students. OGA appears to be a multidetermined problem that is shaped by a broader set of psychological and social factors, such as personality traits, social anxiety, loneliness, and family dynamics (Kang et al., 2012; Liu & Kuo, 2007). For this reason, the present findings should be interpreted as partial rather than comprehensive explanations.

The findings also showed that some relations differed by gender. In particular, the effects of self-disclosure on salience, tolerance, and withdrawal were positive for male students but negative for female students. This pattern suggests that self-disclosure may function differently across gender groups in the context of gaming behavior. For male students, greater self-disclosure may be linked to a stronger tendency to use gaming environments as social spaces. For female students, the same tendency may be less connected to problematic gaming. This interpretation is partly consistent with previous studies showing that problematic gaming has often been reported at higher levels among male participants, although gender differences may be changing over time (Chang et al., 2023; King et al., 2020; Li et al., 2024).

The effect of immediacy on mood modification also differed by gender. This relationship was positive for male students and negative for female students. One possible explanation is that male students may be more likely to use gaming environments for emotional regulation, whereas female students may rely less on gaming for this purpose (Yilmaz et al., 2023). In addition, this finding may indicate that female students approach gaming environments in a less emotionally compensatory way (Gisbert-Pérez et al., 2024). Although some other coefficients also varied in magnitude across gender groups, these differences were not statistically significant. This suggests that the observed gender-based variation was selective rather than general across all communication dimensions. This finding may be related to the fact that males attach more importance to social interactions in gaming environments, as emphasized in C. Choi et al.'s (2018) study. There was no significant difference in the effect of the environmental control dimension by gender, which suggests that environmental factors may be effective in gaming addiction regardless of gender (Konstantinov et al., 2024).

The MGA based on daily Internet use duration showed that the relationship between communication skills and OGA varied across usage groups. In the group that used the Internet for more than seven hours per day, environmental control had a positive effect on salience and mood modification. In the group that used the Internet for less than seven hours per day, these effects were negative. This finding suggests that environmental control may function differently depending on the broader digital context in which students spend their time. For heavier Internet users, a stronger sense of control in online environments may not reduce gaming-related risk and may even coexist with greater gaming salience and mood-related use (Ekinci et al., 2021; Phetphum et al., 2023). The stronger effect of interaction management on salience in the group with higher Internet use also supports the view that online interaction becomes more central as screen exposure increases (Gómez-Galán et al., 2020). However, since most other group differences were not statistically significant, these results should be interpreted cautiously.

Overall, the discussion indicates that ICC was related to OGA only in selective ways. Some dimensions, particularly environmental control and interaction management, showed meaningful associations with specific addiction symptoms, whereas the effects of the remaining dimensions were limited. These findings support the view that problematic gaming should be understood as a multidimensional and multifactorial phenomenon.

CONCLUSION

This study analyzed the relation between ICC and OGA in higher education setting. Findings indicated that the effects of communication competence were limited and selective rather than far-reaching on all dimensions of OGA. Among the dimensions of ICC, environmental control showed significant negative effects on tolerance and abstinence, suggesting that students with stronger environmental control reported lower levels of these addiction symptoms. In contrast, interaction management showed significant positive effects on salience and problems, suggesting that this dimension may not always function as a protective factor in the online gaming context. The remaining dimensions, namely self-disclosure, assertiveness and immediacy, did not show statistically significant effects on most dimensions of addiction. These results suggest that ICC is only related to OGA in specific ways and its role should not be overstated.

Multiple group analyses also revealed that some of these associations varied by gender and duration of daily Internet use. The effects of self-disclosure on salience, tolerance and withdrawal differed by gender, with positive coefficients for male students and negative coefficients for female students. In addition, the effect of immediacy on mode modification withdrawal also differed by gender. Differences were also observed across daily Internet use groups. Environmental control had positive effects on salience and mood modification among students who used the Internet for more than seven hours per day, but negative effects among those who used it for less than seven hours. These findings suggest that the relationship between communication competence and problematic gaming may change depending on students' broader social and digital context.

The study makes an important contribution to the literature in several ways. First, it moves beyond treating ICC as a single overall characteristic and examines its dimensions separately. This is important because the findings show that different communication dimensions do not operate in the same way. Second, the study examines OGA as a multidimensional construct rather than a single total score. This makes it possible to identify which communication dimensions are linked to which addiction symptoms. Third, the study brings these two multidimensional frameworks together in a university student sample and shows that the relationship between them is more complex and limited than broad linear assumptions would suggest. In this respect, the study contributes to the literature by showing that ICC is not a uniform protective factor against OGA and that some dimensions may even be associated with greater gaming salience and problems in certain contexts.

Another contribution of the study is that it highlights the importance of contextual differences. The group-based findings suggest that gender and Internet use duration may shape how communication-related characteristics are associated with gaming behavior. This expands the literature by showing that the effects of ICC may not be stable across all student groups. At the same time, the low R^2 values indicate that communication competence alone explains only a small proportion of the variance in OGA. This finding is also important for the literature, because it supports a multidetermined understanding of problematic gaming and points to the need to consider other psychological and social variables together with communication-related factors.

Overall, the study shows that ICC has a meaningful but limited role in understanding OGA among university students. Its effects are dimension-specific, context-dependent, and relatively weak in explanatory power. Therefore, future research and intervention models should approach OGA as a multifactorial phenomenon and should evaluate communication competence together with other psychosocial variables rather than in isolation

SUGGESTIONS

Based on the results of the study, some recommendations for practitioners were formulated. Training programs should be organized in universities to improve students' communication skills. Preventive intervention programs should be developed for students at risk of gaming addiction. Strategies to help students manage their Internet usage time should be taught. Individual and group counseling services for gaming addiction should be offered in psychological counseling centers. On-campus activities should be organized to improve students' social skills.

Suggestions for future researchers have been prepared. Similar studies should be conducted in different universities and departments. Longitudinal studies should be conducted to examine causal relationships between variables. Qualitative studies should be conducted to examine students' experiences in depth. Comparative analyses should be conducted according to Internet usage patterns and game types. Replication of the study in different cultural contexts is recommended.

Limitations of the Study

The research is a cross-sectional study. Therefore, definite judgments cannot be made about the causal relationships between variables. The study was conducted in a single university. The generalizability of the results is limited. Data collection tools are based on self-reports. This is open to the social favorability effect. The sample size is relatively small, and random sampling was not used. Variables such as game types and motivations for playing games were not examined. Internet usage patterns were not examined in detail. Exogenous variables such as cultural factors and family dynamics were not controlled.

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